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THE NATURALIST BRAZILIAN EXPEDITION.

PAPER I.—FROM RIO DE JANEIRO TO PORTO ALEGRE.

BY HERBERT H. SMITH.

(Continued from page 358.)

ALL the hills in the immediate vicinity of Porto Alegre appear to be formed of granite or porphyry, but I had no opportunity to note the geological features closely. The strips of woodland which remain are less matted than the forests of Rio de Janeiro, and there are fewer vines and palm-trees; ferns are abundant, and we collected a score of species. One of the commonest birds here was a brown species allied to the thrushes, and called, *Joao de barro*—literally, clay-John. It owes this name to its singular nest, which is composed entirely of clay, and roofed over above; it is frequently placed in the most exposed situations, such as the tops of fence-posts, or the dead branches of trees. They are very tame, and I have frequently watched a pair of them at work. They bring the material, soft, unctuous clay, in good sized lumps, which they obtain near some water-course; these lumps, previously well kneaded, are laid first on the post or branch on which the nest is to be built, so as to form a foundation; each portion is well packed in with the bill, which is subsequently used like a trowel to smooth the surface. The sides are built up in the same way, the two birds working incessantly for several days; they seem to prefer rainy or foggy weather, when the wet clay can readily be found, and when the building is not hindered by the too rapid drying of the parts which are already finished. The nest, when completed, is nearly globular, seven or eight inches in diameter, and with walls an inch and a half thick; the cavity may be compared to a mold of a very crooked squash, the larger end forming the nest, and the smaller, turned downwards, the entrance. The clay soon becomes nearly as hard as brick, and the nests may last for many years, though I do not know that the birds use them more than once. In Rio Grande I found the birds breeding in June; three dirty white eggs are laid. This, or a closely allied species is found throughout Southern and Central Brazil.

A gallinaceous bird called *perdiz* (partridge) was also common on the grassy hillsides. Its plumage, prettily mottled with brown, is one of the best examples of protective coloration that I have ever seen. It is paler on the back and dark beneath; seen at a little distance the spots resemble half-withered spikes of grass-seed mingled with shriveled leaf-blades; beneath and on the wings, the markings are nearly perpendicular, simulating stems and leaves. Even the shadows under a grass-patch are mimicked with marvelous fidelity. The bird, when approached, remains perfectly quiet, even allowing one to pass within two or three yards of it; and so perfectly is it concealed by its colors that we seldom noticed it until startled by its sudden flight, almost beneath our feet.

One day we hired a small boat, with two Portuguese oarsmen, to take us to some of the low islands in the river. We found that these were covered, in most places, with swampy forest of no great height, the trees resembling temperate rather than tropical species; there were no palms. These woods gave us a few good insects, and on the shallows near them we found many fresh-water Mollusca—Ampullarias, Anodontas and Unios. In one place we came across a fisherman's house—a mere shed of grass thatch, but serving as shelter for the man and his wife, and four or five babies with the least possible difference of age. One or two clay cooking-pots, a coffee-tin, a plate or two and calabashes for water, with hides to stretch on the ground for beds, constituted the entire property of the establishment, yet the inmates seemed happy enough, and they showed us such hospitality as was in their power. The woman brought us some wild honey, which I grieve to say had strong medicinal properties, at least to our unaccustomed stomachs. Travelers in Brazil should be very cautious about eating the honeys of the native bees; they often act as violent purgatives and cathartics, and some of them are decidedly poisonous.

The man readily consented to fish for me with his cast net, and he soon brought us quite a little heap of small fishes. Some species of Heros and Acara were abundant, as were several Siluridæ with thick, bony plates (Chætostomus, Loricaria). These "armor-fish" remind one of the old Devonian and Carboniferous ganoids, though they are not at all closely related to them. They are common in all the Brazilian rivers, living on the bottom, and sometimes burying themselves in the mud when the waters around them dry up; they will exist in this way, deprived of water except such as moistens the clay around them, for several weeks.

In their movements these Siluroids are very sluggish, and their scale-like armor seems to serve as a real protection against large predatory fishes and icthoyphagous birds.

Before going further it will be well to cast a general glance at the physical features of Rio Grande do Sul. Except the sand-banks and swamps of the lake-region, and some low alluvial lands near the River Uruguay, it may be said that the whole province is hilly or mountainous. The chains cross each other at all angles, and it would be difficult, with our present knowledge, to describe them in detail. In general the land is higher towards the north, and the extreme northern part of the province properly belongs to the great orographic system which lies between the Paraná and the Atlantic. This region is essentially a table-land, much broken and frequently obscured by chains of hills and mountains. Toward the ocean it is abruptly cut down, forming that great rocky wall known as the Serra Geral, Serra do Mar, or Brazilian coast range; to the west it falls gradually, or in a series of mountain terraces to the Paraná. Soon after entering the province of Rio Grande do Sol the Serra Geral bends away to the west, leaving the sea; beyond this the highland edge may be traced in a great curve to the valley of the Uruguay, but it gradually loses its distinctive character; the table-land is cut up by many rivers, and its outlines are lost among ranges of hills and mountains. One of these ranges, parting from the Serra Geral, passes southward through the middle of the province, separating the tributaries of the Uruguay from the streams which flow into the Lagoa dos Patos and the Lagoa Mirim.

Aside from these orographic features, the province is divided into two very distinct physical regions. The rugged northern portion is generally covered with forest, heaviest on the hillsides and along the river-courses, but in the main continuous. The climate here is warm during three-quarters of the year; cool and sometimes cold from May to August, when frosts are frequent and ice is sometimes formed; snow is almost unknown except on the highest mountains. Though this region extends in some places as far as S. lat. 31°, the plants and animals are essentially tropical, resembling those of Rio de Janeiro; palms and tree-ferns are abundant; monkeys and toucans are as common as on the Amazons; and brilliant blue Morpho butterflies, or long-winged Heliconii remind the entomologist that he is still in Brazil. In the southern part of the province all this is changed. There nearly all the land is open prairie, only on the hillsides scattered bushes and low trees form a kind of pseudo-forest.

The climate here is colder and more variable; light snow-storms are common in the winter months, and the ground may remain frozen hard for days together. All this region properly belongs to the pampas of Uruguay and the Argentine Republic; the plants are generally of the same prairie species, and the animals are almost entirely identical. Monkeys, anteaters, tapirs and pacas have disappeared; in their places the naturalist finds deer with branched horns, foxes, armadillos and so on. Instead of parrots, toucans and trogons, there are hawks, ground-thrushes and ostriches; ground-beetles and yellow butterflies, much like those of our home fields, are seen everywhere.

The two regions are very sharply divided, but outlying portions of each are found within the boundaries of the other. On the top of the northern table-land, well within the limits of the forest region, there are extensive tracts of prairie-land; and some of the hillsides, even as far south as Pelotas (lat. 31° 45′) are covered with forest, which has much the same character as the main body of the north. In general, however, it may be said that the dividing line between the forest and prairie lies a little to the north of the River Jacuhy, the upper portion of the Guahyba, which flows from west to east near lat. 30°.

Of course the two regions differ much in their products. The northern portion, beside its forest industries, is the main seat of agricultural employments; the lands are fertile, giving excellent crops of corn, beans, mandioca, sugar-cane and tobacco. The prairie region is generally unfit for agriculture, and it is exclusively used for grazing, more cattle being raised here than in any other part of Brazil.

With the employments so the habits and characters of the people differ greatly. The men of the north are farmers, fond of their homes and seldom traveling far away from them; fixed to the soil by which they are nourished. In the south every laborer is a horseman, accustomed to ride for days and weeks over the hills, and spending very little of his time at home; he lives where his herd lives, eating his dinner of jerked meat and beans, and wrapping himself in his poncho to sleep wherever the night overtakes him. Ignorant in letters, he is wise in all that pertains to his roving existence, despising his more laborious brother of the north. In disposition he is variable; the exigencies of his life have taught him to mistrust strangers, and his rough hospitality is generally guarded by a knife and pistol; so the farmer considers him ill-natured and blood-thirsty. On the whole the two classes have very little to do with each other.

But beyond this a very strong race-distinction has arisen, owing to the influx of German immigrants who have chosen the northern part of the province on account of its mild climate and fertile soil. Of the 700,000 inhabitants of Rio Grande do Sul about 110,000 are Germans or their descendants, and all except a few thousand of these are settled to the north of the River Jacuhy. These figures, however, do not at all represent the importance of the German element. It is the brawn and skill of the province; the element of progress, which is building up manufactures and doing away with the slovenly Brazilian agriculture; the commercial spirit which has given this province, with its one poor seaport, the most important trade south of Santos. The rich northern lands of the province are rapidly being taken up by German agriculturists, and their thriving plantations are seen on every hand. The grazing industry remains in the hands of Brazilians; it is still the most important pursuit of the province, the large amount of prairie land being favorable to it; but as a source of riches it is stationary, or perhaps decadent, the grazers being unable to compete with the great proprietors of Uruguay and the Argentine. The plantations, on the contrary, are yearly increasing in importance.

Porto Alegre owes its commercial importance almost entirely to the German colonies which have been formed in its vicinity. The first of these colonies, that of Sao Leopoldo, was established in 1823, soon after Brazil became an empire; this is now "emancipated," that is, freed from special government control, and it has become a flourishing city of nearly 5000 inhabitants. There are many other colonies, nearly all formed by German immigrants, and preserving the German language and customs; even in Porto Alegre one hears German spoken quite as often as Portuguese. With three exception all the wholesale commercial houses in the city are German, and their warehouses would do honor to any city. There are German retail merchants, physicians, lawyers, schoolmasters; the two most important news-papers in the city are controlled by a German, who edits them equally well, one in German and the other in Portuguese. During our stay in the city a "German Exposition" was in progress, the articles exhibited being agricultural or manufactured products directly derived from the Germans of Southern Brazil; the display was an exceedingly good one.

The colonies are either public or private. In the former the immigrant is assigned a tract of land without payment, and he is under especial official control until such time as the colony is allowed to govern itself. The private colonies are the property of capitalists, who sell portions of land on credit, the payment being commonly in annual installments for five years. This has the advantage of giving the settler a choice of land, and of relieving him from annoying official supervision. Formerly the government paid the passages of immigrants destined for the public lands, but this plan has wisely been abandoned. Of late years the German immigration to this province has somewhat fallen off, and the Italian is taking its place; this is certainly a poor substitute, but it should be remembered that the Italians who come to Brazil are generally farmers or rural laborers—a very different class from the city refuse which goes from Italy to the United States. In Rio Grande do Sul the Italians are generally industrious and frugal, and they are well liked.

This is, perhaps, the only part of Brazil where immigration has been completely successful. The Imperial government has expended vast sums on colonization schemes, some of them visionary, others badly carried out, many doomed from the outset to failure, owing to the poor quality of the colonists. I believe, however, that the main obstacle to successful colonization has been the presence of the slave element and the consequent degradation of labor. An immigrant who has left Europe to better his condition will never be content to work beside an ignorant slave, much less if he himself is treated as an inferior, hardly better than the negro bondsman and only tolerated because he is a necessity. If he is established in a colony, with ground of his own to cultivate, he is still looked down upon by his richer neighbors because he does his own work instead of ordering servants; moreover, he is subject to unpleasant official supervision, and if he tries to escape this by buying a farm without the colonies, he finds that all the good land is absorbed in large plantations. In

Rio Grande do Sul, on the contrary, there are few slaves, and most of these are on the cattle-estates of the south. The free laborer is honored because experience has shown that his industry leads to wealth; there are few large estates, and land can always be purchased on favorable terms. Formerly there was much jealously of the foreign element, but this has nearly disappeared. Finally, the immigrant is contented and happy, because he can mingle with others of his own race, and because he knows that he is creating a bright future for himself and his children.

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THE POLAR ORGANIZATION OF ANIMALS.

BY CHARLES MORRIS.

IN previous papers by the writer under the title of "Organic Physics,"[1] certain fundamental characteristics of protoplasm were considered, and their relation to the functional conditions of the developed animal body traced. There are still other basic conditions in protoplasm which are directly related to the functions of the developed animal. There is no just reason to doubt, indeed, that each separate mass of living protoplasm generalizes in itself all that we find specialized in the highest animal, and that there is no condition unfolded in the man which does not exist potentially in the rhizopod. It is hoped here to show another of those interesting relations.

The self-living mass of protoplasm appears to be a polar organism in a double sense. It seemingly possesses a lateral or chemical polarity, which develops into the sexual polarity of animals. The self-division of the rhizopod is a reproductive function strictly analogous to that existing in the developed animal, and the sexual polarity of the former appears to be represented by a lateral sexual polarity in the latter, the two similar halves of the animal being the two poles in a complete double-sexed organism. This form of polarity has been considered in detail in the papers above referred to. But there is another polarity, which in the rhizopod displays itself in a differentiation of the exterior and the interior functions of the mass. The external region is sensitive, the internal nutritive in function. This statement has more in it than may at first sight appear, for it expresses an organic relation that con-

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[1] AMERICAN NATURALIST, June, July and August, 1882, February and March, 1883.